SOFTWARE FOR THE GE PAC* 4000

GENERAL ELECTRIC
PROCESS AUTOMATION COMPUTERS

GENERAL ELECTRIC

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BENEFITS OF THE GE/PAC 4000 SOFTWARE PACKAGE

Computer software is the intelligence of a computer system that tells the equipment what to do and when to do it. Software includes not only the actual operating program, but all of the aids used by programmers to produce the program.

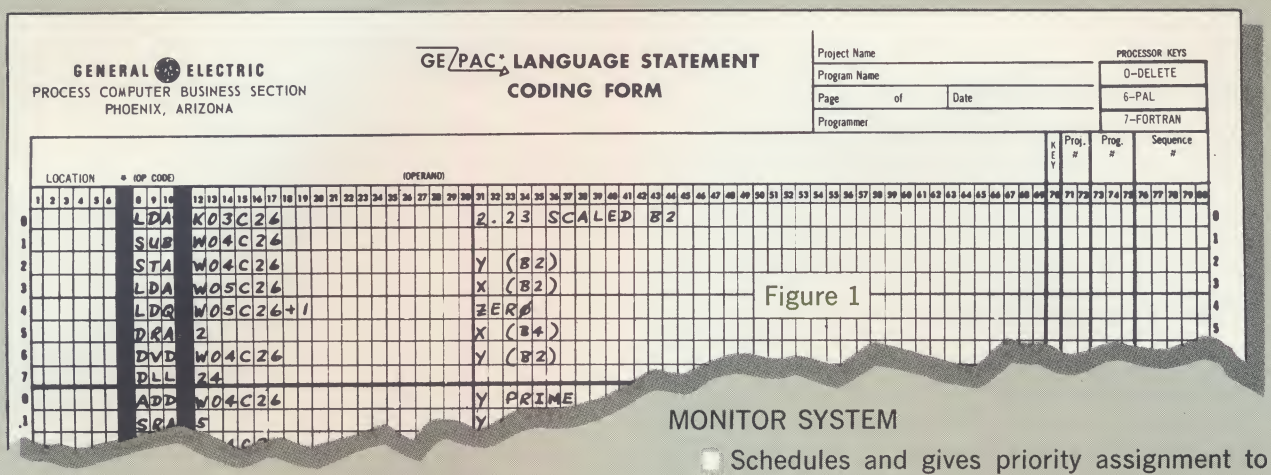
Both initial system expense and long-term operating expense are materially reduced when programming is accomplished in a fast and accurate manner. The GE/PAC 4000 software package reduces programming costs by:

- Facilitating a systematic approach in writing computer programs.
- Offering flexibility for future changes in user process.
- Enabling user to be self-sufficient in developing system programs.
- Providing software designed especially for programming process functions.
- Converting existing FORTRAN II programs to on-line routines.

Complete software packages for the GE/PAC 4000 computers are grouped in three categories: Program Preparation Aids, Standard On-line Functions and Debugging Aids.

PROGRAM PREPARATION AIDS

- Facilitate translating process functions into computer instructions.
- Increase speed and accuracy in preparing programs.
- Aid in documenting and debugging programs.
- Operate locally on GE/PAC 4000, or GE-200 series computer systems.


GENERAL ELECTRIC
PROCESS COMPUTER BUSINESS SECTION
PHOENIX, ARIZONA

GE/PAC LANGUAGE STATEMENT CODING FORM

Project Name
Program Name
Page of Date
Programmer

PROCESSOR KEYS
0-DELETE
6-PAL
7-FORTRAN

KEY | Proj. # | Prog. # | Sequence #

LOCATION • (OP CODE) (OPERAND)

	LDA	K03C26
	SUB	W04C26
	STA	W04C26
	LDA	W05C26
	LDQ	W05C26+1
	DRA	2
	DVD	W04C26
	DLL	24
	ADD	W04C26
	SRA	5

2.23 SCALED B2
Y (B2)
X (B2)
ZERO
X (B4)
Y (B2)
Y PRIME
Y

Figure 1

PROCESS ASSEMBLER LANGUAGE (PAL)

- Enables programmer to code programs in systematic and well-documented fashion.
- Operates on-line as well as off-line.
- Generates single and double precision constants to a specified scale factor or in floating-point format.
- Provides built-in check features which detect and notify programmer of coding errors.
- Produces dynamically relocatable programs.

FORTRAN COMPILERS

- Enable powerful algebraic and verbal statements to be written with minimum time and effort.
- Operate on-line or off-line.
- Permit experienced FORTRAN programmers to make easy transition to GE/PAC 4000 programming.
- Allow previously written FORTRAN II programs to operate on the GE/PAC 4000.
- Allow intermixing of PAL coding and FORTRAN statements for best programming efficiency.

TABULAR SEQUENCE CONTROL (TASC)

- Simplifies and speeds programming of process control functions which are sequential in nature.
- Facilitates subsequent revisions to sequential control programs.

STANDARD ON-LINE FUNCTIONS

- Common routines suitable for numerous applications.
- Require little or no re-work by user programmer.
- Use of pre-checked routines eliminates programming and debugging time.

MONITOR SYSTEM

- Schedules and gives priority assignment to system functions.
- Enables user to have system running on-line in minimum time.
- Provides communication between functions and peripheral equipment.

MATH ROUTINES

- Include commonly used math functions in fixed or floating point, single or double word length arithmetic.
- Available from General Electric library to all GE/PAC 4000 users.
- GE/PAC 4000 users receive up-to-date abstracts of new routines as they are developed.

DEBUGGING AIDS

- Facilitate and simplify on-site trouble-shooting.
- Help locate trouble quickly, reducing delay.

PROGRAM DEBUGGING AIDS

- Include load-compare, memory dump, memory change routines.
- Load-compare and memory dump are available in on-line as well as off-line form.
- On-line debugging aids are plug-in package to MONITOR system.
- Debugging aids proved by on-site experience provide powerful means of keeping program documentation up to date.

HARDWARE DIAGNOSTIC PROGRAMS

- Minimize delays by rapidly testing computer hardware and indicating areas where trouble exists.
- Cover peripheral devices as well as central processor.
- Include on-line detection of peripheral malfunctions with operator alarms and automatic selection of alternate devices if desired.

PROGRAM PREPARATION AIDS

Program Preparation Aids enable a programmer to translate a process function into actual computer instructions. Use of a symbolic language greatly increases the speed and accuracy of preparing a program and also aids in the documentation and debugging of the program.

To provide the programmer with the most effective means of coding a program, General Electric has developed processing programs for three powerful program preparation languages — Process Assembler Language, GE/PAC process FORTRAN, and Tabular Sequence Control.

These language processors are designed to produce operating programs for systems with varying configurations, from simple paper tape I/O, core memory only to large systems with high performance devices such as punched card equipment, magnetic drum, magnetic disc, high-speed printers and remote peripherals.

Additional service to the user has been provided — PAL and FORTRAN processors operate on GE/PAC 4000 or GE-200 series computer systems. The GE-200 series language processor versions enable routines to be assembled or compiled at the various General Electric Information Processing Centers throughout the country and overseas.

PROCESS ASSEMBLER LANGUAGE

The Process Assembler Language accepts coded symbolic instructions and translates them into computer instructions. These symbolic instructions are coded by the programmer on a form, Figure 1, from which cards or paper tapes are punched when the coding is completed. The cards or paper tapes are then read into the computer on which the PAL assembler is operating. The output from the assembler is a listing from a printer or typewriter of the object program and a paper tape or card deck which is used to load the new program into the computer. The assembler program has built-in check features which detect and notify the programmer of many types of coding errors. The listing provides documentation of the program and is invaluable as a debugging aid.

As shown in Figure 2, the listing provides the symbolic instructions as coded and also the octal core locations, instructions, and constants of the assembled program. For further aid in debugging, the listing reproduces all comments from the coding sheet. The three columns of numbers in Figure 2 represent:

- Core location
- Instruction in absolute format (as a debugging aid)
- Instruction in relative format (as actually stored in the computer)

The PAL program makes maximum use of the relative addressing feature of the GE/PAC 4000 computers. It assembles the operand value relative to the location of the instruction itself rather than the absolute value. With this feature, it is possible to operate a program from any place in core memory without modification, thereby adding a new dimension of flexibility to system program organization.

In addition to the computer hardware instructions, PAL translator makes maximum use of pseudo instructions for storage assignments, symbol definition, and generation of constants to provide better programmer efficiency. These instructions include block storage reservation, single and multi-word constants, single and double-word floating constants, etc.

```
000000  04140061  E01C26  STX W01C26,1                                    6YPC2600010
000001  44040061          STQ W02C26                                      6YPC2600020
000002  05004727          TOD 23          IS ARGUMENT NEGATIVE            6YPC2600030
000003  34040043          BTS C02C26      YES                             6YPC2600040
000004  05070720          TEV 16          IS ARGUMENT ZERO                6YPC2600050
000005  34040037          BTS C01C26      YES                             6YPC2600060
000006  05007721          CON 0,0500?721  TOA-TEST ODD,ADD ONE- BIT 17     6YPC2600070
000007  32040054          STA W03C26      CHARACTERISTIC SAVED            6YPC2600080
000010  20040046          ANA K04C26                                      6YPC2600090
000011  30040002          BTR *+2         CCC WAS EVEN ALREADY            6YPC2600100
000012  05014041          SRA 1           CCC WAS ODD- SCALE MANTISSA     6YPC2600110
000013  45002044          SLA 4           SCALE MANTISSA TO B2            6YPC2600120
000014  32040051          STA W05C26      SAVE X                          6YPC2600130
000015  11040035          ADD K01C26      1.6 SCALED B2                   6YPC2600140
000016  32040046          STA W04C26                                      6YPC2600150
000017  00040034          LDA K02C26      DCN 3.2(B4)                     6YPC2600160
000020  42040034          LDQ K02C26+1                                    6YPC2600170
000021  65040043          DVD W04C26      (X+1.6)/3.2                     6YPC2600180
000022  44040042          STQ W04C26                                      6YPC2600190
000023  00040032          LDA K03C26      2.25 SCALED B2                  6YPC2600200
000024  31040040          SUB W04C26                                      6YPC2600210
000025  32040037          STA W04C26      Y (B2)                          6YPC2600220
000026  00040037          LDA W05C26      X(B2                            6YPC2600230
000027  42040037          LDQ W05C26+1    ZERO                            6YPC2600240
000030  45004402          DRA 2           X (B4)                          6YPC2600250
000031  65040033          DVD W04C26      Y (B2)                          6YPC2600260
000032  45007230          DLL 24                                          6YPC2600270
000033  11040031          ADD W04C26      Y PRIME                         6YPC2600280
000034  05014045          SRA 5           Y PRIME/2 IS SQ RT OF X         6YPC2600290
000035  20040021          ANA K04C26      MSKR1/                          6YPC2600300
000036  32040026          STA W04C26      SQ RT OF MANTISSA               6YPC2600310
000037  00040024          LDA W03C26      DIVIDE CHARACTERISTIC           6YPC2600320
000040  05000041          SRL 1           BY 2                            6YPC2600330
000041  20040016          ANA K05C26      SAVE CCC                        6YPC2600340
000042  21040022          ORA W04C26      ADD MANTISSA FOR ANSWER IN A REG 6YPC2600350
000043  11040015          ADD K05C26+1                                    6YPC2600360
000044  42040016  C01C26  LDQ W02C26                                      6YPC2600370
000045  35040014          LPR W01C26                                      6YPC2600380
000046  62040013  C02C26  OOM W01C26                                      6YPC2600390
000047  05046036          SBK 22                                          6YPC2600400
000050  40                                                               6YPC2600410
                                                                         600420
```

Figure 2

FORTRAN COMPILERS

To make the writing of new programs as easy and efficient as possible, General Electric has created FORTRAN compilers for the GE/PAC 4000. These compilers go a step beyond the PAL program in that they enable the programmer to write his program in terms of "statements" which employ familiar language and symbols rather than the symbolic code required by PAL. An example of such a statement might be $Y = A/B + C - SIN\ F\ (D + E)$ where A, B, C, D, and E are variables which have been defined by the programmer in other statements. A statement such as this, when presented to a FORTRAN compiler, will cause the compiler to automatically generate all the step-by-step machine instructions necessary to perform the calculations called for in the statement. Thus, the programmer is freed from the time-consuming details of step-by-step programming and allowed to concentrate more fully on the problem at hand.

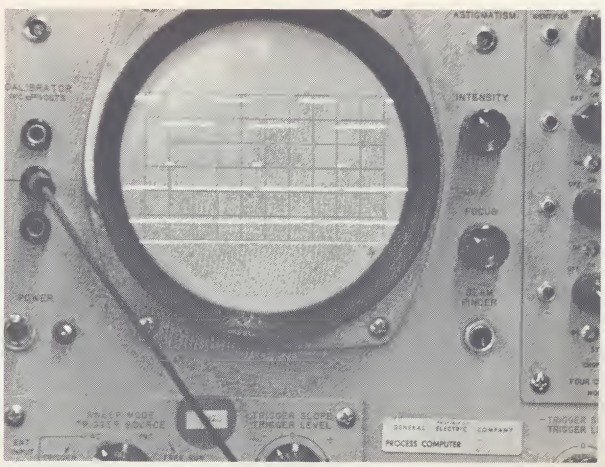
In preparing the FORTRAN compilers for the GE/PAC 4000, General Electric has incorporated several special features which facilitate the writing and running of programs in a real-time process control environment.

COMPATIBILITY WITH MONITOR

The FORTRAN compilers have been designed so that the programs they produce will have numerous special provisions for operation within the GE MONITOR system. Thus, new programs may be easily incorporated into existing MONITOR systems.

LANGUAGE INTERMIXING

The programmer is free to intermix FORTRAN statements with PAL statements within a single program. This allows the programmer to switch back and forth between the two languages arbitrarily, always free to choose the language in which he can proceed most efficiently. Output from the compiler is in the form of PAL symbolic coding.



BIT MANIPULATION CAPABILITY

Special FORTRAN statements are available to the programmer through which he may exploit the ability of the GE/PAC 4000 to manipulate individual bits within a word. In this manner, individual bits may be treated as separate variables and may be set, reset, and tested.

BULK STORAGE — CORE TRANSFERS

Transfers of information between drum or disc storage and core storage may be implemented through the FORTRAN compiler by means of special statements and subroutines provided for this purpose.

FLOATING-POINT OPERATION

Two types of floating-point numbers have been defined for the GE/PAC 4000. FORTRAN compilers are available so that data may be accepted in either single or double-word floating-point form. The program generated by the particular complier may be made to output data in that form.

STATEMENT REPERTORY

A large repertory of allowed statements, plus a full complement of library subroutines, makes for ease and flexibility in programming with the FORTRAN compiler.

Besides providing ease and flexibility in writing new programs, the FORTRAN compiler allows the user's previously written FORTRAN II program to be easily adapted to the GE/PAC 4000. After little or no modification to the source program, the user simply processes the source program through the GE/PAC 4000 FORTRAN compiler. The output from the compiler is then processed through the PAL program, yielding a version of the user's program which is ready to run on the GE/PAC 4000.

TABULAR SEQUENCE CONTROL (TASC)

In cases where it is desired to program a process control function which is sequential in nature (such as process start-up and shut-down under computer control), the time and effort required to program such a function may be reduced by using TASC, a special language offered by General Electric TASC permits the programmer to code information in tabular form concerning each control action in the sequence. Examples of this tabular information are: (a) identification of the control action, (b) number of times to try the action, and (c) amount of time to allow for completion of the action.

The TASC assembly program operates on this information to produce a program which will control the timing and order of execution of a group of subroutines. With each of these subroutines designed to execute some specific control action, the desired process control sequence is achieved. (Note: The subroutines themselves are not produced by TASC. They must be written separately to meet individual process needs.)

In addition to fixed sequences of control actions, TASC is capable of producing programs which will make choices between alternate sequences based on real-time process dynamics. The TASC assembler program operates on the Process Computer Business Section house computer to produce GE/PAC 4000 control programs.

STANDARD ON-LINE FUNCTIONS

Standard on-line functions are portions of a total system program that are common from one computer application to another. Because they are used so frequently, optimum execution time and utilization of memory have been stressed in their development. For most applications, the use of these functions require little or no re-work by user programmers. Use of these pre-checked routines reduces programming and debugging time.

MONITOR SYSTEM

MONITOR is the generic name that has come into usage to refer to the system of programs which perform standard functions in real-time digital computer applications. Because the term MONITOR is so non-specific, the GE/PAC software in this general category is described in terms of the standard modules which perform the major functions frequently included under the broad general term.

REAL-TIME OPERATING SYSTEM (RTOS)

The Real-Time Operating System, RTOS, encompasses those functions essential to the successful process control digital computer application and a few optional program modules which are closely allied to these essential functions. RTOS is modular to provide easy tailoring to a specific hardware configuration and to specific system needs. The primary modules are:

REAL-TIME EXECUTIVE (RX)

RX provides the executive control function of RTOS. It is a multiprogramming executive characterized by a function-priority scheme which permits the interruption of low-priority programs by higher priority programs. Provision is included for overriding normal priorities when system needs dictate the completion of a current program or sequence of programs.

System time-keeping and general housekeeping tasks such as switching control between programs are performed by standard subroutines of RX. Accurate time of day is maintained in units commensurate with system needs.

BULK MEMORY MODULE

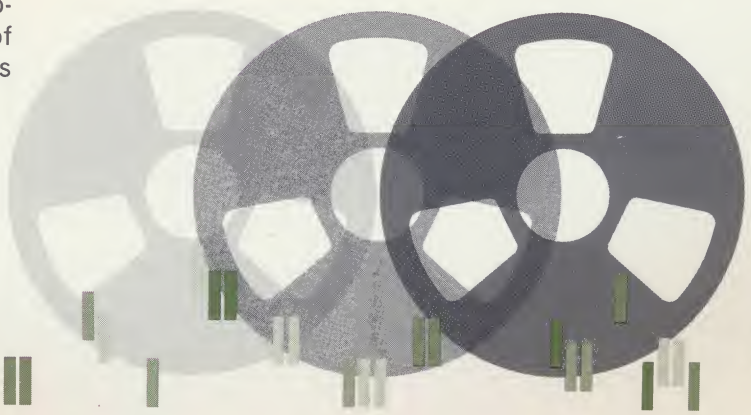
The bulk memory module augments the real-time executive to provide for retaining functional programs in drum or disc memory. Controlling all transfers of information between core memory and bulk memory, it also maintains maps of working core memory which facilitate efficient use of all available core memory.

INPUT/OUTPUT SUBSYSTEM

The input/output subsystem controls the operation of all the man-communication peripheral equipment which connects to the computer via the input/output buffer. It provides for simultaneous operation of peripherals in parallel with internal computation, stacks requests for the use of peripherals, and performs all data conversions and formatting required for the output of standard internal data forms.

PERIPHERAL DIAGNOSTIC SUBSYSTEM

This subsystem monitors the operation of peripheral equipment, detects and reports malfunctions of peripherals, and provides automatic switching of output to alternate devices if alternates are provided in the system. When feasible it communicates with the system operator for efficient recovery from malfunctions such as card-feed failures.



FORTRAN INTERFACE MODULE

The FORTRAN interface module is required when FORTRAN-generated programs are to be operated under RTOS. It provides additional data-conversion capabilities for inputs, provides additional formatting for input and output, and monitors the execution of assigned go to and computed go to statements.

PROCESS COMMUNICATION SUBSYSTEMS

For each standard GE/PAC hardware module designed for direct communication between the computer and the process to be monitored or controlled, there is a software subsystem designed for operational compatibility with RTOS. These software subsystems allow the system programmer to obtain efficient operation of the hardware modules through the medium of standard request subroutines.

ANALOG SCANNING SUBSYSTEM

This subsystem consists of a request subroutine, an interrupt-activated driver subroutine, and a functional program which operates on a fixed time cycle.

The driver subroutine actually operates the scanner to fill the scanning requests which are queued for it by the request subroutine. Several different versions of driver subroutine are available to accommodate local and remote scanners and various scan speed requirements. Drivers typically include some or all of the following functions in addition to their prime function of operating the hardware.

- Scaling of inputs
- Scanner offset correction
- Thermocouple reference junction correction
- Gain optimization
- Communication with RX

The request subroutine accepts requests for buffered or non-buffered, high priority or normal scanning of analog sensors connected to one or more local or remote scanners. It stacks the requests for processing by the driver subroutine.

The functional program which is part of this subsystem makes periodic requests for the scanning of shorted inputs for measurement of amplifier offset and maintains weighted-average offset values. The driver subroutines use these average offsets to correct scanned inputs to an effective zero offset.

MULTIPLE-OUTPUT CONTROLLER SUBSYSTEM

This subsystem consists of a request subroutine and one or more interrupt-activated driver subroutines which function with the framework of RTOS to enable functional programs to request operation of local and remote multiple-output controllers.

Provision is included for making priority or normal, buffered or non-buffered requests for the following kinds of outputs:

- Non-latched contact outputs
- Non-timed, latched contact outputs
- Timed, latched contact outputs (local only)
- Pulsed contact outputs (local only)
- Analog outputs
- Decimal outputs

TIMED-OUTPUT CONTROLLER

This subsystem consists of a request subroutine and an interrupt-activated driver subroutine. They operate within the framework of RTOS to enable functional programs to request output through the timed-output controller connected locally or through the GE/PAC remote scanner.

It includes provision for requesting buffered or non-buffered, priority or normal requests for the following functions:

- Closing (or opening) of a specified contact pair for a specified period of time.
- Delivery of a specified number of pulses for the operation of a stepping motor.

REMOTE SCANNER SUBSYSTEM

This subsystem consists of request subroutines and a general purpose interrupt-activated input/output driver subroutine.

This highly complex driver subroutine of this subsystem provides for the operation of any of the devices which may be connected to the GE/PAC remote scanner. It accepts and processes requests stacked for it by many different request subroutines including those of the analog scanning subsystem, the multiple-output controller subsystem, and the timed-output controller subsystem.

A special request subroutine is included for requesting remote digital inputs.

PROGRAMMER/OPERATOR UTILITY SERVICE SUBSYSTEMS

Since it is inconvenient at best and virtually impossible at worst to stop a process control computer to perform necessary program maintenance and modification, it is imperative that provision be included in a process computer software system for performing such functions on-line, while the computer continues to perform its normal tasks. Furthermore, in many applications the high speed and efficiency of the GE/PAC computer results in appreciable "spare time" when the computer is performing no useful work relative to the process control application. It is desirable in such systems to include provision for the performance of "background" tasks, perhaps totally unrelated to the process, which can be performed when the system is not using the full capacity of the computer.

These on-line maintenance and "background" capabilities are provided in GE/PAC software through the inclusion within the total MONITOR system of on-line programmer/operator utility service subsystems.

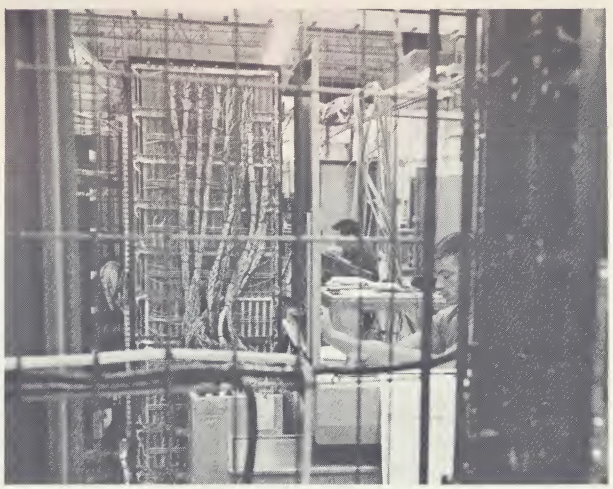
ON-LINE OPERATOR (OPR)

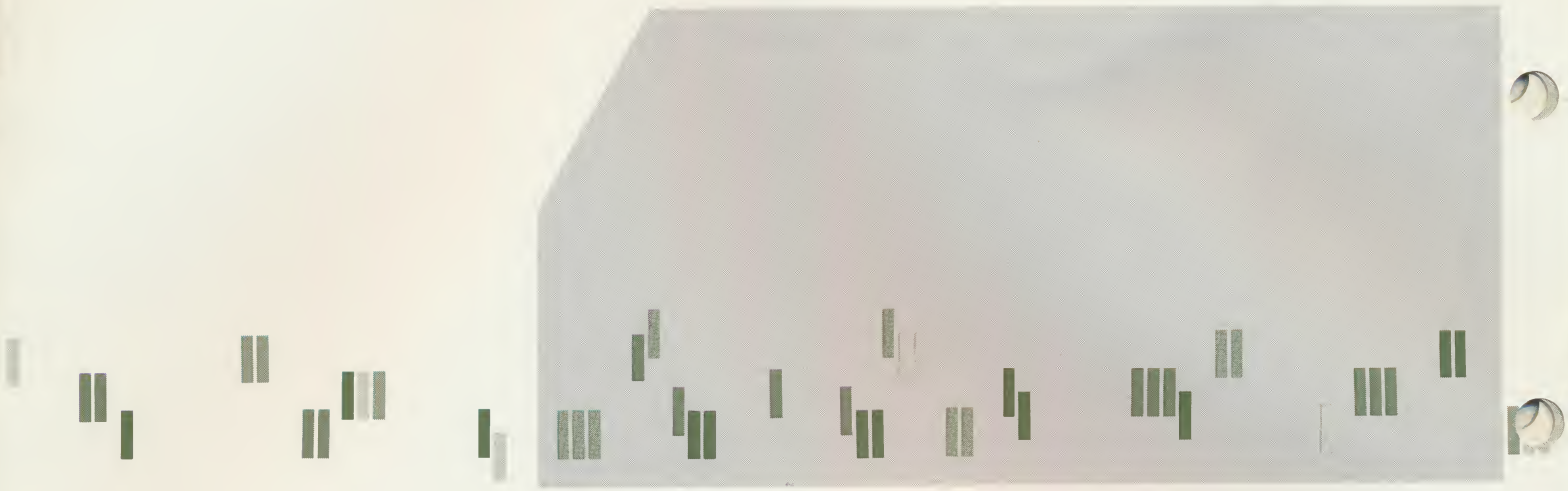
The OPR subsystem consists of an executive and a group of programs designed to perform specific operator-requested functions generally helpful in system dubugging and maintenance. The OPR executive operates within the framework of RTOS as a functional program. It is activated by the input driver of the input/output subsystem upon receipt of an input demand from the keyboard of an I/O typewriter.

When activated, the OPR executive communicates with the human operator via the I/O keyboard to determine which of the available programs is required. It then activates the requested program, which continues the communication with the operator to determine the parameters required to fully define the requested operation.

Functions available under the OPR Subsystem include:

- Program Loader
- Printed Memory Dump
- Punched Memory Dump
- Memory Compare
- Memory Change
- Set Clock and Calendar
- Change Program Status
- Change Peripheral Status
- Media Conversion
- Establish Memory Protect Status (GE/PAC 4020 only)





FREE-TIME SYSTEM (FTS)

This subsystem provides a powerful and flexible batch-mode operating system complete with library maintenance, language processing, and program debugging capabilities all operating in the "background" (at lowest priority) of the GE/PAC Real-Time Operating System. A full description of the characteristics and capabilities of FTS may be found in a separate brochure or in the GE/PAC Free-Time System User's Manual.

MATH ROUTINES

Math routines which are usually used in subroutine form include fixed or floating-point, single or double-precision math functions. These routines are available from the General Electric library to all GE/PAC 4000 computer users. They may be obtained in the form of punched cards or paper tape, along with flowcharts, listings and instructions for their use. Examples of these routines are square root, trigonometric, exponential functions, etc.

DEBUGGING AIDS

General Electric offers a group of standard routines specifically designed to aid the programmer or maintenance person in pinpointing trouble within the computer system. On-site experience has shown these debugging aids to be extremely valuable in terms of on-site system implementation. The difficulties posed by the inherent complexity of the computer system may be minimized by use of these routines, and costly delays are thereby reduced.

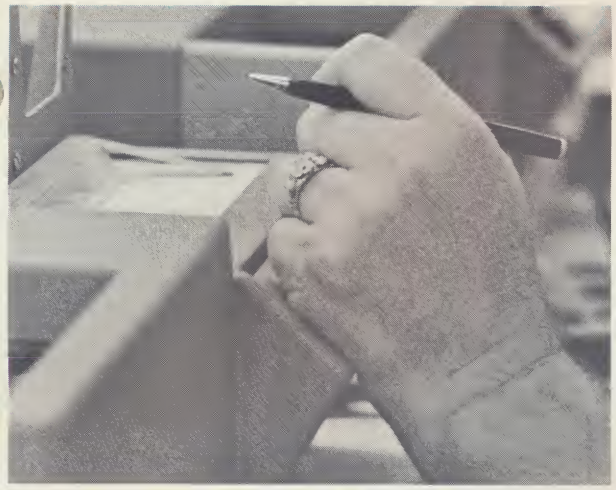
Debugging aids for GE/PAC 4000 computers fall into two categories: Program Debugging Aids (for trouble-shooting software) and Hardware Diagnostic Programs (for trouble-shooting hardware).

PROGRAM DEBUGGING AIDS

Experience has shown that program debugging aids provide a powerful means of updating program documentation as well as helping the programmer to locate errors in his program. General Electric has developed extremely useful program debugging aids. The OPR subsystem of MONITOR provides the basic requirements for on-line debugging. They may be run at the same time the main process monitoring and control functions are being executed. This is accomplished by allowing the debugging routines to utilize whatever free time is available in the central processor. Debugging may be accomplished without interrupting normal process monitoring and control functions.

Program loaders provide the means to load programs and data into computer storage through punched-card or paper-tape readers. In addition, a wired-in loader is available for initial program loading. The compare-memory program is available for use by the programmer in cases where he suspects that a part of his program may have accidentally become altered or destroyed in memory. Each location in memory is compared with the corresponding entry on a paper tape or card deck of the program in question. If any disagreement exists, the program types out the address of the memory location, the contents of the memory location, and the contents of the corresponding entry on paper tape or card deck. The dump program is used to record the contents of computer memory, either through the typewriter or printer, paper-tape punch or card punch.

The memory change program is used for changing the contents of a core, drum or disc location through an input typewriter. Documentation showing the location, contents before change, and



contents after the change are typed out on the console typewriter.

The memory change program has the added facility of displaying the location and its contents before the change is executed.

More sophisticated debugging capability is provided by the free-time system, including full automatic memory protection and the entry of symbolic debugging parameters.

HARDWARE DIAGNOSTIC PROGRAMS

General Electric offers a comprehensive package of hardware diagnostic programs for the GE/PAC 4000 computers. These programs have proved highly effective in helping maintenance personnel locate trouble in the computer hardware in a rapid and systematic way.

The use of these routines causes the computer to execute sequences of instructions which are designed to "exercise" specific sub-groups of hardware in worst-case fashion. The manner in which the computer responds to these sequences of instructions may be interpreted by referring to a diagnostics handbook which is furnished with the routines. The trouble-shooter is able to "home in" on the trouble in a direct and logical way. Naturally, these hardware diagnostic programs must be run in off-line fashion.

The hardware diagnostic package for the GE/PAC 4000 computers include the following routines:

- Arithmetic unit diagnostic
- Core test
- Drum or disc test
- Automatic program interrupt test
- Peripheral buffer test and peripheral test
- Scanner test

SOFTWARE SPECIFICATIONS

PAL ASSEMBLER

ASSEMBLING MACHINE:	GE-215, GE-225, GE-235
INPUT:	Punched cards or magnetic tape
OUTPUT:	Punched cards, program listing
MEMORY REQUIRED:	8K of core
PERIPHERALS:	Console typewriter, card reader and punch, high-speed printer, magnetic tape units
ASSEMBLING MACHINE:	GE/PAC 4000 computer
INPUT:	Punched cards or paper tape
OUTPUT:	Punched cards or paper tape, program listing
MEMORY REQUIRED:	8K of core
PERIPHERALS:	I/O console typewriter, card reader and punch or paper-tape reader and punch, high-speed printer (option)

FORTRAN COMPILER

COMPILING MACHINE:	GE-215, GE-225, GE-235
INPUT:	Punched cards
OUTPUT:	Magnetic tape (PAL format), program listing
MEMORY REQUIRED:	8K of core
PERIPHERALS:	Console typewriter, card reader, magnetic tape units, high-speed printer
COMPILING MACHINE:	GE/PAC 4000 computer
INPUT:	Punched cards or paper tape
OUTPUT:	Punched cards or paper tape, program listing
MEMORY REQUIRED:	8K of core
PERIPHERALS:	I/O console typewriter, card reader and punch or paper-tape reader and punch, high-speed printer (option)

TASC ASSEMBLER

ASSEMBLING MACHINE:	Process Computer Business Section house computer
INPUT:	Punched cards or magnetic tape
OUTPUT:	Punched cards or paper tape, magnetic tape, program listing

The software described in this brochure consists of programs now available and those planned for the near future. General Electric reserves the right to change and/or delete software projects without notice.

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